

Testing a group selection system by small coupe harvesting in Granville Forest, Westland

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BACKGROUND

Changing views on protection of forests are having a profound effect on long-term planning for forest management worldwide. In New Zealand the practice of clearfelling native forest for timber production or its conversion to exotic plantations became unacceptable. The new Forests Amendment Act 1993 intends management of indigenous forest for timber production to be on a basis of ecologically sustainable silviculture in order to retain natural values of the forests. Conservation of forests as habitats for native flora and fauna has, therefore, to become an integral part of any sustainable forest management planning.

Two-thirds of New Zealand's 6.2 million ha indigenous forest are dominated by the beeches (*Nothofagus* sp.). It has been optimistically estimated that more than 0.5 million hectares, much of this in private forest, could be potentially productive if brought under sustainable management in accordance with the Forests Amendment Act 1993.

The four native beeches are capable of providing high-quality hardwood timber and with their good growth rates are a major resource suitable for sustainable management. Past research evolved the means to manage red beech (*Nothofagus fusca*) and silver beech (*N. menziesii*) in extensive clear-felling regimes using conventional, high impact logging technologies. However, little information exists on low impact, small-scale management of indigenous beech forest.

The Forests Amendment Act 1993 has triggered an urgent need for operational research into low-impact sustainable management of indigenous beech forests to fill substantial gaps in our knowledge. The Act's key management prescription requires the felling of regeneration coupes to be not larger than 0.5 hectare without special exemption, but the effects of such small coupe fellings on beech forest remain unclear.

With this in mind the Ministry of Forestry (MOF) has funded a research contract for the New Zealand Forest

Research Institute (NZFRI) to establish and monitor a trial of small coupe harvesting in Westland beech forest. The research was supported by Timberlands West Coast Ltd who provided a research site in hard beech (*Nothofagus truncata*) at Granville Forest, operational support and aerially harvested the trial.

OBJECTIVES

The overall aim is to develop systems of productive management that can ensure the natural features of beech forest are protected to a high degree. Thus it is intended to:

- test the sustainability of the group-selection system of silviculture in beech forest;
- evaluate the immediate and long-term implications of 0.1 ha regeneration feelings, with the aim of containing the impacts within limits similar to those of natural forest processes;
- monitor with permanent plots subsequent forest health, regrowth and composition;
- develop a practical approach to minimise damage of pinhole beetles to forest health and wood degrade.

The significance of pinhole management through stand hygiene is recognised as central to beech research.

METHODS AND PROGRESS TO DATE

The small coupe harvesting of timber in Granville forest addresses factors of landscape, soil and water values, biota habitat and diversity in relation to silvicultural management by the group selection system. The long-term monitoring of the trial coupes will measure forest change and is designed around three aspects:

- coupe **regeneration**, regrowth stand development and health;
- forest **health**, and stability adjacent to coupes;
- compositional **diversity** and forest **structure**.

The 38 hectare research compartment lies within beech-podocarp forest (PB5) and is predominantly hard beech with a subcanopy of Westland quintinia and kamahi, typically on steep slopes (ca 30°) with very acid (pH<4.0) soils. It is considered to be difficult beech forest to

manage.

Coupe size was planned to be around 0.1 ha, well within the range of natural gaps, to duplicate "near-natural" silviculture and sustain natural values. This decision was based on results of NZFRI/Landcare ecological research and a review of small-scale beech management practice.

Nine sites for regeneration coupes were selected in February 1994. These sites were confirmed by standard "recce" plot analysis as representative of common forest subtypes to be found over much of the 10,000 ha of surrounding forest (Rob Allen pers. comm.).

Three landforms of spur, sideslope and hollow were chosen for coupe sites to cover microsite variation, with three replicates on each landform. Coupes were selected largely on the basis of stand structure and natural tree grouping. Prior to felling, permanent transects were established across the coupes and in adjacent forest with 10x10 m subplots for trees, saplings and woody debris, and a continuous centre-line of 0.5x1.0 m subplots for tree seedling, herbaceous plants, ground cover and duff assessment.

Three coupe treatments, in three replicates covering the landform types, provide a range of residual logging debris designed to test the harvesting hygiene required to reduce *Platypus* build-up to tolerable levels. These treatments are:

- **debris coupe** – extraction of merchantable material only;
- **clean coupe** – extraction of all material > 10 cm diameter;
- **extra clean coupe** – extraction to 10 cm diameter plus treatment of stumps to discourage pinhole beetles.

The helicopter is recognised as having huge potential for lessening the harvesting impacts on much of North Westland's "Forest Accord" areas. Beech on extensive areas of steep, highly dissected land (as at Granville), commonly has vulnerable tree root-plates perched on nutritionally poor and very shallow soils. Thus roading networks have the potential for much environmental damage.

During March-April the felling and helicopter extraction were completed by Timberlands in several stages:

- As a necessary part of preparing the

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regeneration coupes, the subcanopy of quintinia and kamahi was "prefelled" and trees over 10 cm dbh were lifted out by small helicopter (Robinson and Hughes 500) from all coupes.

- The felling of the main canopy trees for harvest then commenced with careful directional felling to avoid damaging trees adjacent to the marked coupe. Almost all trees fell as directed, due to bushmen taking the time necessary for applying wedging skills.
- The main harvest extraction was completed by Timberlands using a Mil 17 heavy lift helicopter with capacity to haul up to 5 tonnes. The influence of rotor down-draft in windstill conditions required some additional felling of coupe-edge pole trees to reduce safety risks. Avoidance of lift-out damage to canopies of emergent trees on the lower edges of coupes is an important operational factor to control.
- A small helicopter (Robinson) was used most effectively to remove from the clean and extra-clean coupes any residual material that was >10 cm diameter.

The aerial harvesting appears successful from a silvicultural point of view and has avoided the site disturbance associated with conventional ground harvesting and roading. Soil disturbance has been minimal and felling activity has left the surface in a condition suitable for adequate regeneration of beech and other canopy species. However, the safety issue of rotor down-draft indicated that at an operational scale very small coupes can probably not always be harvested by helicopter.

In all some 465 tonnes of logs were



Beech Management Research Compartment (38 ha) for investigating impacts of small coupe harvesting, Granville Forest, North Westland. The forest is predominantly of hard beech (*Nothofagus truncata*) on steep slopes with shallow, acid soils. The photo was taken after completion of aerial harvesting of nine coupes close to the central ridge on the southern face. Photo: Ian Platt

extracted by helicopter from the nine coupes in a total harvest area of 1.1 ha. This approximated to 385 m³/ha, with 49% of this graded as hard beech logs of

sawable dimension. Twenty-eight per cent of the total extracted log volume consisted of subcanopy tree species, mostly quintinia and kamahi but with some rata and miro.

After harvesting, coupe edge trees were tagged and described for future health assessment. Ground cover subplots were reassessed to quantify the ground disturbance from the helicopter harvesting.

The nine coupes are now in place and the clean-up operations of material > 10 cm diameter on the "hygiene" coupes have ensured that the fundamental questions of the trial can be addressed through ongoing monitoring of the permanent plots located across coupes and untouched forest.

THE FUTURE

In the Granville research block it will be most important to maintain a long-term commitment to periodic remeasurement of coupe transects and associated plots. Definitive results are not expected to become clear in less than three years to detect damage associated with pinhole beetles, five years for answers to questions of regeneration and adjacent forest wind-throw, and up to decades for the successional and structural patterns of stand development. The processes are expected



Selection of 0.1 ha regeneration coupe in a group of 28-metre-tall, mature hard beech (*N. truncata*) with subcanopy of Westland quintinia (*Quintinia acutifolia*) and kamahi (*Weinmannia racemosa*). Photo: U. Benecke

to show similarity to those occurring in natural, tree-fall gaps.

After successfully completing the harvesting and permanent plots in hard beech, further cooperative planning is now in progress between NZFRI, MOF and Timberlands West Coast for a second trial of small felling coupes to commence in the 1994/95 season. If undertaken, this second series of coupes will be in red and silver beech stands on gentle slopes and low-impact ground harvesting of regeneration fellings will be tested at different times of year. Following completion of the red-silver beech trial, a third series is to be planned for silver beech forest in Western Southland. Results of these trials are intended to be particularly relevant to the small private forest owner aiming for sustainable forest management under the Forests Amendment Act 1993.

A Focus

To get the most out of this operational research investment, the small-coupe trials are aimed to act as a focus for other collaborative work. It is the intention to integrate university and other inter-agency beech research projects with the NZFRI programme. Project topics of interest are to include:

- regeneration ecology of natural gaps and small coupe fellings;



Helicopter extraction of "prefelled" subcanopy trees, mostly of quintinia and kamahi, from a group of hard beech selected for regeneration felling. Photo: Ian Platt

- ecology of pinhole beetles – factors

minimising outbreaks in natural and managed stands to acceptable levels;

- floristic and nutrient processes as influenced by necromass and wood removal;
- ecology of fauna in regenerating beech forest in natural and managed stands.

The present series of trials should define the economic and ecological consequences of practising group selection silviculture through small-coupe harvesting.

Fundamental shift

It will be important for the research results to be incorporated into economic management while meeting the broader aims of the Act to retain natural values of indigenous forests. In the long run, to achieve such dual objectives will require an understanding as to the significance of permanent or "continuous" forest at a within-stand scale. Not unexpectedly, the practice of ecologically sensitive "continuous" forestry is old and has its origin in 19th century European silviculture. Some 50 years ago it was taken up again and developed into the concepts of "near-natural" silviculture. These concepts were "rediscovered" in recent years and are now gaining influence in forest planning as a promising and acceptable way to achieve sustainable development and management of multi-purpose forest resources.



0.1 ha regeneration coupe in hard beech after directional felling and extraction of logs by helicopter, resulting in minimal disturbance to soil and surrounding forest. Canopy height ca 28 metres. Photo: Ian Platt